Jawaharlal Nehru Technological University Anantapur

(Established by Govt. of A.P., Act. No. 30 of 2008)

Ananthapuramu–515 002 (A.P) India

II year B.Tech

Course Structures and Syllabi under R19 Regulations

JNTUA Curriculum
Electrical & Electronics Engineering B. Tech Course Structure

2nd Year to 4th Years Course Structure

Semester – 3 (Theory - 6, Lab – 3, MC-1)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A54302	Complex Variables & Transforms	BS	2-1-0	3
2.	19A02301T	Basic Electrical Circuits	PC	2-1-0	3
3.	19A02302	Power System Architecture	PC	2-1-0	3
4.	19A02303T	DC Machines & Transformers	PC	2-1-0	3
5.	19A04306T	Semiconductor Devices and Circuits	PC	1-1-0	2
6.	19A04304	Digital Electronics and Logic Design	PC	2-1-0	3
7.	19A02303P	DC Machines & Transformers Lab	PC	0-0-3	1.5
8.	19A04306P	Semiconductor Devices and Circuits Lab	PC	0-0-3	1.5
9.	19A02301P	Basic Electrical Circuits Lab	PC	0-0-3	1.5
10.	19A99302	Biology For Engineers	MC	3-0-0	0
				Total	**21.5**

Semester - 4 (Theory - 6, Lab – 2, MC-1)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A54401	Numerical Methods & Probability Theory	BS	2-1-0	3
2.	19A02401T	Electrical Circuit Analysis	PC	2-1-0	3
3.	19A02402	Engineering Electromagnetics	PC	2-1-0	3
4.	19A02403	Power Electronics	PC	2-1-0	3
5.	19A04405	Analog Electronic Circuits	PC	2-1-0	3
6.	19A05304T	Python Programming	ES	2-1-0	3
7.	19A02401P	Electrical Circuit Analysis Lab	PC	0-0-3	1.5
8.	19A04406	Electronic Circuits Lab	PC	0-0-3	1.5
9.	19A99301	Environmental Science	MC	3-0-0	0
				Total	**21**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

L	T	P	C
2	1	0	3

19A54302 COMPLEX VARIABLES AND TRANSFORMS

(Common to ECE & EEE)

Course Objective:

This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables. The student develops the idea of using continuous/discrete transforms.

Unit-I: Complex Variable – Differentiation:

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions (exponential, trigonometric, logarithm), harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method-Conformal mappings-standard and special transformations (sin z, e^z, cos z, z^2) Mobius transformations (bilinear) and their properties.

Unit Outcomes:

Students will be able to

- Understand functions of Complex variable and its properties.
- Find derivatives of complex functions.
- Understand the analyticity of complex functions .
- Understand the conformal mappings of complex functions.

Unit-II: Complex Variable – Integration:

Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Liouville's theorem (without proof) and Maximum-Modulus theorem (without proof);power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi circle with f(z) not having poles on real axis).

Unit Outcomes:

Students will be able to

- Understand the integration of complex functions.
- Apply Cauchy's integral theorem and Cauchy's integral formula.
- Understand singularities of complex functions.
- Evaluate improper integrals of complex functions using Residue theorem.

Unit-III: Laplace Transforms

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

Unit Outcomes:

Students will be able to

- Understand the concept of Laplace transforms and find the Laplace transforms of elementary functions.
- Find the Laplace transforms of general functions using its properties.
- Understand Laplace transforms of special functions(Unit step function, Unit Impulse & Periodic).
- Apply Laplace transforms to solve Differential Equations.

Unit-IV: Fourier series

Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions- typical wave forms - Parseval's formula- Complex form of Fourier series.

Unit Outcomes:

Students will be able to

- Understand finding Fourier series expression of the given function.
- Determine Fourier coefficients (Euler's) and identify existence of Fourier series of the given function.
- Expand the given function in Fourier series given in Half range interval.
- Apply Fourier series to establish Identities among Euler coefficients.
- Find Fourier series of wave forms.

Unit-V: Fourier transforms & Z Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem .

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

Unit Outcomes:

Students will be able to

- Find Fourier Sine and cosine integrals.
- Understand Fourier transforms.
- Apply properties of Fourier transforms.
- Understand Z transforms.
- Apply properties of Z transforms.
- Apply Z transforms to solve difference equations.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India

Reference Books:

1. B.V.Ramana, Higher Engineering Mathematics, Mc Graw Hill publishers.
2. Alan Jeffrey, Advanced Engineering Mathematics, Elsevier.

Course Outcomes:

After the completion of course, students will be able to

- Understand the analyticity of complex functions and conformal mappings.
- Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
- Understand the usage of Laplace Transforms, Fourier Transforms and Z transforms.
- Evaluate the Fourier series expansion of periodic functions.

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B.Tech – II-I Sem

L	T	P	C
2	1	0	3

19A02301T BASIC ELECTRICAL CIRCUITS

Course Objectives:

To make the student learn about

- Basic characteristics of R, L, C parameters, their Voltage and Current Relations and Various combinations of these parameters.
- The Single Phase AC circuits and concepts of real power, reactive power, complex power, phase angle and phase difference
- Series and parallel resonances, bandwidth, current locus diagrams
- Network theorems and their applications
- Network Topology and concepts like Tree, Cut-set , Tie-set, Loop, Co-Tree.

Unit- 1 Introduction to Electrical & Magnetic Circuits

Electrical Circuits: Circuit Concept – Types of elements - Source Transformation-Voltage - Current Relationship for Passive Elements. Kirchhoff's Laws – Network Reduction Techniques-Series, Parallel, Series Parallel, Star-to-Delta or Delta-to-Star Transformation. Examples

Magnetic Circuits: Faraday's Laws of Electromagnetic Induction-Concept of Self and Mutual Inductance-Dot Convention-Coefficient of Coupling-Composite Magnetic Circuit-Analysis of Series and Parallel Magnetic Circuits, MMF Calculations.

Unit Outcomes:

- To know about Kirchhoff's Laws in solving series, parallel, non-series-parallel configurations in DC networks
- To know about voltage source to current source and vice-versa transformation in their representation
- To understand Faraday's laws
- To distinguish analogy between electric and magnetic circuits
- To understand analysis of series and parallel magnetic circuits

Unit- II Single Phase A.C Circuits

R.M.S, Average Values and Form Factor for Different Periodic Wave Forms – Sinusoidal Alternating Quantities – Phase and Phase Difference – Complex and Polar Forms of

Representations, j-Notation, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation- Phasor diagrams - Concept of Power Factor-Concept of Reactance, Impedance, Susceptance and Admittance-Apparent Power, Active and Reactive Power, Examples.

Unit Outcomes:

- To understand fundamental definitions of 1-ϕ AC circuits
- To distinguish between scalar, vector and phasor quantities
- To understand voltage, current and power relationships in 1-ϕ AC circuits with basic elements R, L, and C.
- To understand the basic definitions of complex immittances and complex power
- To solve 1-ϕ AC circuits with series and parallel combinations of electrical circuit elements R, L and C.

Unit- III Three Phase A.C. Circuits

Introduction - Analysis of Balanced Three Phase Circuits – Phase Sequence- Star and Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems - Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems. Analysis of Three Phase Unbalanced Circuits - Loop Method - Star Delta Transformation Technique – for balanced and unbalanced circuits - Measurement of Active and reactive Power – Advantages of Three Phase System.

Unit Outcomes:

- To know about advantages of 3-ϕ circuits over 1-ϕ circuits
- To distinguish between balanced and unbalanced circuits
- To know about phasor relationships of voltage, current, power in star and delta connected balanced and unbalanced loads
- To know about measurement of active, reactive powers in balanced circuits
- To understand about analysis of unbalanced circuits and power calculations

Unit- IV Network Theorems

Superposition, Reciprocity, Thevenin’s, Norton’s, Maximum Power Transfer, Millmann’s, Tellegen’s, and Compensation Theorems for D.C and Sinusoidal Excitations.

Unit Outcomes:

- To know that electrical circuits are ‘heart’ of electrical engineering subjects and network theorems are main part of it.
- To distinguish between various theorems and inter-relationship between various theorems

- To know about applications of certain theorems to DC circuit analysis
- To know about applications of certain theorems to AC network analysis
- To know about applications of certain theorems to both DC and AC network analysis

Unit- V Network Topology

Definitions – Graph – Tree, Basic Cutset and Basic Tieset Matrices for Planar Networks – Loop and Nodal Methods of Analysis of Networks & Independent Voltage and Current Sources – Duality & Dual Networks. Nodal Analysis, Mesh Analysis.

Unit Outcomes:

- To understand basic graph theory definitions which are required for solving electrical circuits
- To understand about loop current method
- To understand about nodal analysis methods
- To understand about principle of duality and dual networks
- To identify the solution methodology in solving electrical circuits based on the topology

Course Outcomes:

After completing the course, the student should be able to do the following

- Given a network, find the equivalent impedance by using network reduction techniques and determine the current through any element and voltage across and power through any element.
- Given a circuit and the excitation, determine the real power, reactive power, power factor etc,.
- Apply the network theorems suitably.
- Determine the Dual of the Network, develop the Cut Set and Tie-set Matrices for a given Circuit. Also understand various basic definitions and concepts.

Text Books:

1. Fundamentals of Electric Circuits Charles K. Alexander and Matthew. N. O. Sadiku, Mc Graw Hill, 5th Edition, 2013.
2. Circuit Theory (Analysis & Synthesis) A. Chakrabarti, Dhanpat Rai & Sons, 7th Revised Edition, 2018.

Reference Books:

1. Engineering circuit analysis William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 7th Edition, 2006.
2. Network Analysis M.E Van Valkenberg, Prentice Hall (India), 3rd Edition, 1999.
3. Electrical Engineering Fundamentals V. Del Toro, Prentice Hall International, 2nd Edition, 2019.
4. Electric Circuits- Schaum's Series, Mc Graw Hill, 5th Edition, 2010.
5. Electrical Circuit Theory and Technology John Bird, Routledge, Taylor & Francis, 5th Edition, 2014.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

L	T	P	C
2	1	0	3

19A02302 POWER SYSTEM ARCHITECTURE

Course Objectives:

To make the student learn about:

- The block diagram and operation of Conventional Power generating systems and their components.
- The role of non conventional power generating systems and their operation and economic aspects.
- Calculation of different transmission line parameters and their use.
- Modelling of transmission line and evaluation of constants.

UNIT-I CONVENTIONAL POWER GENERATING SYSTEMS

Thermal Power: Block Diagram of Thermal Power Station (TPS), Brief Description of TPS Components

Hydro Power: Selection of Site, Classification, Layout, Description of Main Components.

Nuclear Power: Nuclear Fission and Chain Reaction-Principle of Operation of Nuclear Reactor.-Reactor Components: Moderators, Control Rods, Reflectors and Coolants.- Radiation Hazards: Shielding and Safety Precautions.- Types of Nuclear Reactors.

Unit Outcomes: *At the end of the unit, the student will be able to*

- Understand the concept of layout and design aspects of Thermal, Hydro and Nuclear Power Plants.
- Obtain the principle of operation of Thermal, Hydro and Nuclear Power Plants.

UNIT -II NON CONVENTIONAL POWER GENERATING SYSTEMS

Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Solar Energy Collectors, Different Methods of Energy Storage – PV Cell- V-I Characteristics.

Wind Power Generation: Role and potential of Wind Energy Options, Horizontal and Vertical Axis Wind Mills- Performance Characteristics-Pitch & Yaw Controls – Economic Aspects.

Biogas Power Generation: Principles of Bioconversion, Types of Biogas Digesters – Characteristics of Bio-Gas- Utilization- Economic and Environmental Aspects.

Geothermal and Ocean Power Generation: Principle of Geothermal Energy Methods of Harnessing-Principle of Ocean Energy-Tidal and Wave Energy- Mini Hydel Plants- Economic Aspects.

Unit Outcomes: At the end of the unit, the student will be able to

- Understand the concept of design of Solar, Wind, Bio-Gas, Geothermal and Ocean Power generation.
- Obtain the principle of operation of Solar, Wind, Bio-Gas, Geothermal and Ocean Power generation.

UNIT-III TRANSMISSION LINE PARAMETERS

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configurations with and without transposition. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

Unit Outcomes: *At the end of the unit, the student will be able to*

1. Obtain the transmission line parameters for different types of lines and also for symmetrical and asymmetrical single and three phase, single and double circuit lines.

UNIT – IV MODELING OF TRANSMISSION LINES

Classification of Transmission Lines - Short, medium and long lines and their models - representations - Nominal-T, Nominal-π and A, B, C, D Constants. Mathematical Solutions to estimate regulation and efficiency of all types of lines- Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations – Representation of Long lines – Equivalent T and Equivalent – π, Numerical Problems. – Surge Impedance and surge Impedance loading - wavelengths and Velocity of propagation – Ferranti effect, Charging current, Need of Shunt Compensation.

Unit Outcomes: At the end of the unit, the student will be able to

- Obtain the classification of transmission lines and A,B,C,D constants for transmission lines, need of shunt compensation.

UNIT-VGENERAL ASPECTS OF DISTRIBUTION SYSTEMS

Classification of Distribution Systems - Comparison of DC & AC and Under-Ground & Over - Head Distribution Systems. Voltage Drop and power loss in D.C Distributors for the following cases: Radial D.C Distributors fed at one end and at ends (equal/unequal Voltages), Uniform loading and Ring Main Distributor, LVDC Distribution Network. Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, feeder loading; basic design of secondary distribution. Voltage Drop and power loss in A.C. Distributors.

SUBSTATIONS:

Location of Substations: Rating of distribution substations, service area within primary feeders. Benefits derived through optimal location of substations.

Classification of substations: Air insulated substations - Indoor & Outdoor substations: Substation layout showing the location of all the substation equipment.

Bus bar arrangements in Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar, Double breaker – One and half breaker system with relevant diagrams, lightening arrestors, Substation grounding.

Unit Outcomes: At the end of the unit, the student will be able to

- Compare DCvs AC and Under-Ground vs Over - Head Distribution Systems, types of Distribution Systems.
- Get the knowledge about Design of Distribution Feeders, Voltage Drop and power loss in A.C. Distributors.
- Learn Substation and types of Substations, Various arrangements in Substations.

Course Outcomes:

After completing the course, the student should be able to do the following:

CO1 Remember and understand the concepts of conventional and nonconventional power generating systems.

CO2 Apply the economic aspects to the power generating systems.

CO3 Analyse the transmission lines and obtain the transmission line parameters and constants.

CO4 Design and Develop the schemes to improve the generation and capability of transmission line to meet the day to day power requirements.

TEXT BOOKS:

1. M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, “Power System Engineering”, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. C.L Wadhwa, “Electric Power Generation Distribution and Utilization”, New Age International (P) Ltd., 2005.
3. G.D. Rai, “Non Conventional Energy Sources” Khanna Publishers, 2000.

REFERENCE BOOKS:

1. John Twidell and Tony Weir, “Renewable Energy Resources”, Second Edition, Taylor and Francis Group, 2006.
2. S. N. Singh, “Electrical Power Generation, Transmission and Distribution”, PHI, 2003.
3. V.K. Mehta and Rohit Mehta, “Principles of Power Systems”, S. Chand & Company, LTD., New Delhi 2004.
4. S. N. Bhadra, D. Kastha & S. Banerjee, “Wind Electrical Systems”. Oxford University Press, 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

L	T	P	C
2	1	0	3

19A02303T DC MACHINES & TRANSFORMERS

UNIT-I

Magnetic Material Properties and Applications:
Introduction, Magnetic materials and their properties, magnetically induced emf and force, AC operation of magnetic circuits, hysteresis and eddy current losses, permanent magnets, and applications of permanent magnet materials.
Principles of electromechanical energy conversion:
Energy in magnetic system, field energy and mechanical force, multiply-excited magnetic field systems, forces/torques in systems with permanent magnets, energy conversion via electric field, dynamical equations of electro mechanical systems

Unit Outcomes:

- Able to understand the electromechanical energy conversion system
- To understand about various magnetic materials, properties and Applications

UNIT-II

DC Generators
Constructional details of DC machine, principle of operation of DC generator, armature windings and its types, emf equation, armature reaction, effect of brush lead, demagnetizing and cross magnetizing ampere turns, compensating windings, commutation, emf induced in a coil undergoing commutation, methods of improving commutation, OCC and load characteristics of different types of generators.
Parallel operation of DC Generators: DC shunt and series generators in parallel, equalizing connections

Unit Outcomes:

- Able to understand the construction, operation and armature windings of a DC generator
- Able to analyze the characteristics of DC generators

UNIT-III

DC Motors

Force on conductor carrying current, back emf, Torque and power developed by armature, speed control of DC motors(Armature control and Flux control methods), Necessity of starters, constructional details of 3-point and 4-point starters, characteristics of DC motors, Losses in DC machines, condition for maximum efficiency

Testing of DC machines: Brake test, Swinburne's test, Hopkinson's test, Fields test, Retardation test.

Unit Outcomes:

- Able to analyze speed control of DC motors, testing methods and parallel operation of DC machines
- Analyze the characteristics of DC motors

UNIT-IV

Single Phase Transformers

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagrams(no load and on load), Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, losses and efficiency Testing - open circuit and short circuit tests, voltage regulation,Sumpner's test, separation of hysteresis and eddy current losses. Parallel operation of single-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer.

Unit Outcomes:

- Able to understand the construction, operation and parallel operation of transformer
- To predetermine the efficiency and regulation of a transformer

UNIT-V

Three Phase Transformers

Three-phase transformer – construction, types of connection and their comparative features, Phase conversion - Scott connection, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers- Cooling of transformers.

Unit Outcomes:

- Able to understand and analyze the phase conversions
- Analyze the tap changing of transformers

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the concepts of magnetic circuits.
- Understand the operation of DC machines.
- Analyse the differences in operation of different DC machine configurations.
- Analyse single phase and three phase transformers circuits.

Text Books:

1. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
2. I. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education,2010.

References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004.
3. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.

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B.Tech – II-I Sem

L	T	P	C
1	1	0	2

19A04306T SEMICONDUCTOR DEVICES AND CIRCUITS

Course Objectives:

- To study the characteristics of various types of semiconductor devices.
- To apply the characteristics of semiconductor devices to develop engineering solutions.
- To analyze functioning of various types of electronic devices and circuits.

Unit1

p-n junction Diode: Qualitative theory of the p-n junction, p-n junction as a diode, current components in a p-n diode, Volt-Ampere characteristics, Temperature dependence of p-ndiode characteristics, Diode resistance, Qualitative treatment of Transition and Diffusion capacitances.
Diode as Rectifier: Half wave and Full wave rectifier, Bridge rectifier, Filters – Inductor and Capacitor Filter. Ripple factor with and without filters.

Unit Outcomes:

- Explain the concept of p-n junction as diode (L2)
- Apply the concept of diode for developing rectifiers (L3)
- Analyse temperature dependence of diode characteristics (L4)

Unit2

Special Purpose Diodes: Zener versus Avalanche breakdown, Principle of operation, characteristics and applications of Zener diode, Tunnel diode, Photo diode, LED, PIN diode, Schottky barrier diode and Varactor diode.
Bi-Polar Junction Transistor: Junction transistor, Transistor current components, Transistor as an amplifier, Input and Output characteristics of BJT in Common Base, Common Emitter and Common Collector configurations. Transistor as a switch.

Unit Outcomes:

- Study the characteristics of various special purpose diodes and BJT (L2)
- Apply the concepts of special purpose diodes and BJT to solve engineering problems (L3)
- Compare the BJT characteristics in various configurations (L4)

Unit 3

Transistor biasing and Stabilization: The Operating Point, DC & AC load lines, Bias Stability, Fixed Bias, Collector-to-Base Bias, Self-Bias, Bias Stabilization, Bias Compensation, Thermistor and Sensistor Compensation, Thermal Runaway, Thermal Stability.
Small Signal Low-frequency Transistor Models: Transistor Hybrid Model, Determination of the h parameters from the characteristics, Analysis of Transistor amplifierusing h parameters, Comparison of Transistor amplifier configurations.

Unit Outcomes:

- Explain the concept of biasing and its temperature stability and compensation (L2)
- Apply transistor hybrid model to calculate h-parameters (L3)
- Analyse transistor amplifier using h-parameters (L4)

Unit 4

Low-frequency Transistor Amplifier circuits: Simplified Common-emitter Hybrid Model, Simplified Calculations for the Common-Collector, Common-base and Common-emitter amplifier, Common emitter amplifier by passed and un-bypassed Emitter Resistance, Miller's Theorem, Dual of Miller's Theorem.

Unit outcomes:

- State Miller's and dual of Miller's theorems (L1)
- Apply the concept of BJT to develop amplifier circuits (L3)
- Analyse the simplified hybrid model of transistor in various configurations (L4)

Unit5

Field-effect Transistors: The Junction Field-effect Transistor, The Pinch-off Voltage, The JFET Volt-Ampere Characteristics, MOSFET characteristics (Enhancement and depletion mode), The FET and MOSFET Small-signal Model, Biasing of FET and MOSFET.

The Common-source Amplifier, The Common-drain Amplifier, A Generalized FET Amplifier, The FET as a Voltage-variable Resistor.The Unijunction Transistor.

Unit outcomes:

- Study the characteristics of JFET, MOSFET and UJT (L2)
- Apply the characteristics of FETs and UJT to develop engineering solutions (L3)

Course Outcomes:

CO1. List various types of semiconductor devices (L1)
CO2. Study the characteristics of various types of semiconductor devices (L2)
CO3. Apply the characteristics of semiconductor devices to develop engineering solutions (L3)
CO4. Analyse functioning of various types of electronic devices and circuits (L4)

Text Books:

1. J.Millman, C. C. Halkias and Satyabrata Jit, "Electronic Devices and Circuits",4th edition, Mc Graw Hill, 2015.
2. S. Salivahanan, N. Suresh Kumar, "Electronic Devices and Circuits", 4th edition, McGraw-Hill, 2017.

References:

1. J.Milliman, C. C. Halkias and Chetan Parikh, "Integrated Electronics", 2nd edition, Mc Graw Hill, 2010.
2. David A. Bell, "Electronic Devices and Circuits", 5th edition, Oxford, 2008.

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B.Tech – II-I Sem

L	T	P	C
2	1	0	3

19A04304 DIGITAL ELECTRONICS AND LOGIC DESIGN
(Common to EEE & ECE)

Course Objectives:

- To teach significance of number systems, conversions, binary codes and functionality of logic gates.
- To discuss different simplification methods for minimizing Boolean functions.
- To impart knowledge on operation, characteristics and various configurations of TTL and CMOS logic families.
- To outline procedures for the analysis and design of combinational and sequential logic circuits.
- To introduce programmable logic devices.

Unit I

Number Systems and Codes: Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess -3 codes, Gray code.
Binary codes Classification, Error detection and correction – Parity generators and checkers – Fixed point and floating-point arithmetic.
Boolean Algebra& Logic Gates: Boolean operations, Boolean functions, Algebraic manipulations, Min-terms and Maxterms, Sum-of-products and Product-of-sum representations, Two-input logic gates, NAND /NOR implementations.
Minimization of Boolean Functions: Karnaughmap, Don't-care conditions, Prime implicants, Minimization of functions using Quine-McClusky method.

Unit Outcomes:

- Summarize advantages of using different number systems. (L2)
- Explain usefulness of different coding schemes and functionality of logic gates. (L2)
- Apply basic laws and De Morgan’s theorems to simplify Boolean expressions. (L3)
- Compare K- Map and Q-M methods of minimizing logic functions. (L5)

Unit II

Combinational Circuits: Introduction, Analysis of combinational circuits, Design Procedure– Binary Adder-Subtractor, Decimal Adder, Multiplier, Comparator, Code Converters, Encoders, Decoders, Multiplexers, Demultiplexers, Illustrative examples.

Sequential Circuits-1: Introduction, Latches –RS latch and JK latch, Flip-flops-RS, JK, T and D flip flops, Master-slave flip flops, Edge-triggered flip-flops, Flip-flop conversions.

Unit Outcomes:

- Apply Boolean algebra for describing combinational digital circuits. (L2)
- Analyze standard combinational circuits such as adders, subtractors, multipliers, comparators etc. (L4)
- Design various Combinational logic circuits. (L4)
- Implement logic functions with decoders and multiplexers. (L5)

Unit III

Sequential Circuits-2: Analysis and Design of Synchronous Sequential Circuits: Moore and Mealy machine models, State Equations, State Table, State diagram, State reduction & assignment, Synthesis using flip flops, Elements of Design style, Top–down design, Algorithmic state Machines (ASM), ASM chart notations.
Registers and Counters: Registers, shift registers, Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.

Unit Outcomes:

- Describe behaviour of Flip-Flops and Latches.(L2)
- Compare Moore and Mealy machine models.(L5)
- Design synchronous sequential circuits using flip flops and construct digital systems using components such as registers and counters (L4)
- Utilize concepts of state and state transition for analysis and design of sequential circuits (L3)

Unit IV

Memory and Programmable Logic: RAM, Types of Memories, Memory decoding, ROM, Types of ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL) and Programmable Logic Array (PLA), Design of combinational and sequential circuits using PLDs.

Unit Outcomes:

- Define RAM, ROM, PROM, EPROM and PLDs. (L1)
- Describe functional differences between different types of RAM & ROM. (L2)
- Compare different types of Programmable Logic Devices. (L5)
- Design simple digital systems using PLDs. (L4)

Unit V

Digital Logic Families: Unipolar and Bipolar Logic Families, Transistor-Transistor Logic (TTL): Operation of TTL, Current sink logic, TTL with active pull up, TTL with open collector output, Shockley TTL, TTL characteristics, I^2L, ECL logic Families.
CMOS: CMOS Inverter, CMOS characteristics, CMOS configurations - Wired Logic, Open drain outputs, Interfacing: TTL to CMOS and CMOS to TTL, Tristate Logic, Characteristics of Digital ICs: Speed, power dissipation, figure of merit, fan-out, Current and voltage parameters, Noise immunity, operating temperature range, power supply requirements.

Unit Outcomes:

- Summarize significance of various TTL , I^2L, ECL and CMOS subfamilies. (L2)
- Examine Interface aspects of TTL & CMOS logic families. (L5)
- Explain characteristics of digital ICs such as speed, power dissipation, figure of merit, fan-out, noise immunity etc. (L2)
- Compare bipolar and MOS logic families. (L5)

Course Outcomes:

After completion of the course, student will be able to
CO1: Understand various number systems, error detecting, correcting binary codes, logic families, combinational and sequential circuits. (L1)
CO2: Apply Boolean laws, k-map and Q-M methods to minimize switching functions. Also describe the various performance metrics for logic families. (L2)
CO3: Design combinational and sequential logic circuits. (L4)
CO4: Compare different types of Programmable logic devices and logic families. (L5)

TEXTBOOKS:

1. M. Morris Mano and Michael D. Ciletti, “Digital Design", 4th Edition Pearson Education, 2013.
2. Z. Kohavi and N. K. Jha, “Switching and Finite Automata Theory”, Third Edition, Tata McGraw Hill, 2010.
3. R. P. Jain, "Modern Digital Electronics", 4th edition, McGraw Hill Education , India Private Limited, 2012.

REFERENCES:

1. J.F Wakerly, “Digital Design: Principles and Practices”, 4th Edition, Pearson India, 2008.
2. Charles H Roth (Jr) and Larry L. Kinney, “Fundamentals of Logic Design”, 5th Edition Cengage Learning India Edition, , 2010.
3. John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

L	T	P	C
0	0	3	1.5

19A02303P DC MACHINES & TRANSFORMERS LAB

Course Objectives:

To conduct various experiments on

- DC motors and DC Generators
- The speed control techniques of DC motors.
- To conduct various experiments for testing on 1-phase transformers

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Brake test on DC shunt motor. Determination of performance curves.
4. Swinburne's test on DC shunt motor,Predetermination of efficiency.
5. Speed control of DC shunt motor (Armature control and Field control method).
6. Hopkinson's tests on DC shunt machines. Predetermination of efficiency.
7. OC and SC test on single phase transformer
8. Parallel operation of single phase transformers.
9. Sumpner's test on single phase transformers.
10. Load test on DC long shunt compound generator. Determination of characteristics.
11. Load test on DC short shunt compound generator. Determination of characteristics.
12. Separation of losses in DC shunt motor.

Note: Minimum ten experiments are required to be conducted as compulsory experiments:

Course Outcomes:

CO1Able to conduct and analyze load test on DC shunt generators
CO2 Able to understand and analyze magnetization characteristics of DC shunt generator
CO3 Able to understand and analyze speed control techniques and efficiency of DC machines
CO4 Able to understand to predetermine efficiency and regulation of single phase Transformers

Reference Book:

1. D. P. Kothari and B. S. Umre, Laboratory Manual for Electrical Machines, I.K International Publishing House Pvt. Ltd., 2017

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

19A04306P SEMICONDUCTOR DEVICES AND CIRCUITS LAB

All the experiments shall be conducted and there is no choice.

List of Experiments:

1. Draw and study the characteristics of Semi-conductor diodeand calculate static and dynamic resistance
2. Draw and study the characteristics of Zener Diodeand study its application as Regulator
3. Draw and study the input and output characteristics of Transistor in Common Emitter configuration
4. Draw and study the input and output characteristics of Transistor in Common Base configuration
5. Draw and study the drain and transfer characteristics of FET in Common Source Configuration
6. Draw and study the characteristics of UJT
7. Rectifiers
    a. To simulate the rectifiers and trace their output waveforms with and without filters using PSPICE / Multisim
    b. To design half wave, full wave & bridge rectifiers with and without filters, using discrete components and calculate ripple factor in each case.
8. Common Emitter Amplifier (Self bias Amplifier)
    a. Design and simulate self- biasCommon Emitter amplifier using PSPICE /Multisim and study the Gain and Bandwidth of the amplifier
    b. Designself- biasCommon Emitter amplifierwith discrete components and calculate the bandwidth of amplifier from its frequency response
9. Miller's and Dual of Millers's theorem
    a. Design and simulate to Prove the Miller's and dual of Miller's theorem in CE amplifier
    b. Design and construct the amplifier with discrete components to prove Miller's and dual of Miller's theorem
10. FET Amplifier
    a. Design and simulate common source FET amplifier using PSPICE /Multisim and study the Gain and Bandwidth of amplifier
    b. Design common source FET amplifier with discrete components and calculate the bandwidth of amplifier from its frequency response

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

L	T	P	C
0	0	3	1.5

19A02301P BASIC ELECTRICAL CIRCUITS LAB

Hands-on experiments related to the course contents of **Electrical Circuit Analysis**

1. Verification of Thevenin's and Norton's Theorems
2. Verification of Superposition Theorem for average and rms values
3. Maximum Power Transfer Theorem for DC and AC circuits
4. Verification of Compensation Theorem for DC circuits
5. Verification of Reciprocity, Millmann's Theorems for DC circuits
6. Determination of Self, Mutual Inductances and Coefficient of Coupling
7. Measurement of Active Power for Star Connected Balanced Loads
8. Measurement of Reactive Power for Star Connected Balanced Loads
9. Measurement of 3-Phase Power by Two Wattmeter Method for Unbalanced Loads
10. Measurement of Active Power for Delta Connected Balanced Loads
11. Measurement of Reactive Power for Delta Connected Balanced Loads

Course Outcomes:

At the end of the course, students will be able to

CO1: Remember, understand and apply various theorems and verify practically.

CO2: Understand and analyze active, reactive power measurements in three phase balanced & un balanced circuits.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

L	T	P	C
3	0	0	0

19A99302 BIOLOGY FOR ENGINEERS

Course Objectives: To provide basic understanding about life and life Process. Animal an plant systems. To understand what bimolecules, are, their structures are functions. Application of certain bimolecules in Industry.

- Brief introduction about human physiology and bioengineering.
- To understand hereditary units, i.e. DNA (genes) and RNA and their synthesis in living organism.
- How biology Principles can be applied in our daily life using different technologies.
- Brief introduction to the production of transgenic microbes, Plants and animals.

Unit I: Introduction to Basic Biology

Cell as Basic unit of life, cell theory, Cell shapes, Cell structure, Cell cycle. Chromosomes. Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Plant tissues and Animal tissues, Brief introduction to five kingdoms of classification.

Unit Outcomes:

After completing this unit, the student will be able to

- Summarize the basis of life. (L1)
- Understand the difference between lower organisms (prokaryotes) from higher organisms (eukaryotes). (L2)
- Understand how organisms are classified. (L3)

Unit II: Introduction to Biomolecules

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what are biomolecules? their role in living cells, their structure, function and how they are produced. (L1)
- Interpret the relationship between the structure and function of nucleic acids. (L2)
- Summarize the applications of enzymes in industry. (L3)
- Understand what is fermentation and its applications of fermentation in industry. (L4)

Unit III: Human Physiology

Nutrition: Nutrients or food substances. Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle. Excretory system.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what nutrients are (L1)
- Understand the mechanism and process of important human functions (L2 & L3)

Unit IV: Introduction to Molecular Biology and recombinant DNA Technology

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. rDNA technology. Introduction to gene cloning.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand and explain about gene structure and replication in prokaryotes and Eukaryotes (L1)
- How genetic material is replicated and also understands how RNA and proteins are synthesized. (L2)
- Understand about recombinant DNA technology and its application in different fields.(L3)
- Explain what is cloning. (L4)

Unit V: Application of Biology

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, biochips, Bio fuels, and Bio Engineering. Basics of Production of Transgenic plants and animals.

Unit Outcomes:

After completing this unit, the student will be able to Understand.

- How biology is applied for production of useful products for mankind.(L1)
- What are biosensors, biochips etc. (L2)
- Understand transgenic plants and animals and their production (L3)

Course Outcomes:

After studying the course, the student will be able to:

- Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
- Explain about biomolecules, their structure and function and their role in the living organisms. How biomolecules are useful in Industry.
- Briefly about human physiology.
- Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
- Know about application of biological Principles in different technologies for the production of medicines and Pharmaceutical molecules through transgenic microbes, plants and animals.

Text books:

1. P.K.Gupta, Cell and Molecular Biology, 5th Edition, Rastogi Publications -
2. U. Satyanarayana. Biotechnology, Books & Allied Ltd 2017

Reference Books:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A Global Approach", Pearson Education Ltd, 2018.
2. T Johnson, Biology for Engineers, CRC press, 2011
3. J.M. Walker and E.B. Gingold, Molecular Biology and Biotechnology 2nd ed.. Panima Publications. PP 434.
4. David Hames, Instant Notes in Biochemistry –2016
5. Phil Tunner, A. Mctennan, A. Bates & M. White, Instant Notes – Molecular Biology –-2014

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

L	T	P	C
2	1	0	3

19A54401 NUMERICAL METHODS AND PROBABILITY THEORY

(Common to EEE and MECH)

Course Objective:

This course aims at providing the student with the knowledge on

- Various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations.
- The theory of Probability and random variables.

Unit-I: Solution of Algebraic & Transcendental Equations:

Introduction-Bisection method-Iterative method-Regula falsi method-Newton Raphson method

System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.

Unit Outcomes:

Students will be able to

- Calculate the roots of equation using Bisection method and Iterative method.
- Calculate the roots of equation using Regula falsi method and Newton Raphson method.
- Solve the system of algebraic equations using Gauss Jordan method and Gauss Siedal method.

Unit-II: Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

Unit Outcomes:

Students will be able to

- Understand the concept of interpolation.
- Derive interpolating polynomial using Newton's forward and backward formulae.
- Derive interpolating polynomial using Lagrange's formulae.
- Derive interpolating polynomial using Gauss forward and backward formulae.

Unit-III: Numerical Integration & Solution of Initial Value Problems to Ordinary Differential Equations

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule
Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

Unit Outcomes:

Students will be able to

- Solve integral equations using Simson's 1/3 and Simson's 3/8 rule.
- Solve integral equations using Trapezoidal rule.
- Solve initial value problems to ordinary differential equations using Taylor's method.
- Solve initial value problems to ordinary differential equations using Euler's method and Runge Kutta methods.

Unit-IV: Probability theory:

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

Unit Outcomes:

Students will be able to

- Understand the concept of Probability.
- Solve problems on probability using addition law and multiplication law.
- Understand Random variables and probability mass and density functions.
- Understand stastical constants of random variables.

Unit-V: Random Variables & Distributions:

Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties-Uniform distribution-exponential distribution

Unit Outcomes:

Students will be able to

- Understand Probability distribution function.
- Solve problems on Binomial distribution.
- Solve problems on Poisson distribution.
- Solve problems on Normal distribution.

Course Outcomes:

After the completion of course, students will be able to

- Apply numerical methods to solve algebraic and transcendental equations
- Derive interpolating polynomials using interpolation formulae
- Solve differential and integral equations numerically
- Apply Probability theory to find the chances of happening of events.
- Understand various probability distributions and calculate their statistical constants.

Text Books:

1. B.S.Grewal, "Higher Engineering Mathematics", Khanna publishers.
2. Ronald E. Walpole, "Probability and Statistics for Engineers and Scientists", PNIE.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India

Reference Books:

1. B.V.Ramana, "Higher Engineering Mathematics", Mc Graw Hill publishers.
2. Alan Jeffrey, "Advanced Engineering Mathematics", Elsevier Publishers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

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2	1	0	3

19A02401T ELECTRICAL CIRCUIT ANALYSIS

Course Objectives:

- To know the analysis of three phase balanced and unbalanced circuits and to measure active and reactive powers in three phase circuits.
- Knowing how to determine the transient response of R-L, R-C, R-L-C series circuits for D.C and A.C excitations.
- To know the applications of Fourier transforms to electrical circuits excited by non-sinusoidal sources.
- Study of Different types of filters, equalizers.

Unit - I: Locus Diagrams & Resonance

Series R-L, R-C, R-L-C and Parallel Combination with Variation of Various Parameters - Resonance-Series, Parallel Circuits, Frequency Response, Concept of Bandwidth and Q Factor.

Unit Outcomes:

The student will be able to

- Learn about basic concepts of Locus diagrams with different parameter variations of Electrical circuit elements
- Learn about occurrence of resonance with the presence of electrical circuit elements under certain operating conditions

Unit - II: Two Port Networks

Two Port Network Parameters – Impedance – Admittance - Transmission and Hybrid Parameters and their Relations - Concept of Transformed Network - Two Port Network Parameters Using Transformed Variables.

Unit Outcomes:

The student will be able to

- Understand and estimate the network parameters of T & π configurations of DC circuits or resistive elements
- Understand how Laplace transforms studied in mathematics courses, can be applied to identifying energy storage elements in electrical circuits

Unit - III: Transient Analysis

D.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for D.C Excitation - Initial Conditions in network - Initial Conditions in elements - Solution Method Using Differential Equation and Laplace Transforms - Response of R-L & R-C Networks to Pulse Excitation.
A.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for Sinusoidal Excitations - Solution Method Using Differential Equations and Laplace Transforms.

Unit Outcomes:

The student will be able to

- Distinguish between classical method and Laplace transform approach in analysing transient phenomenon in DC excitations
- Distinguish between classical method and Laplace transform approach in analysing transient phenomenon in sinusoidal excitations

Unit - IV: Fourier Transforms

Fourier Theorem - Trigonometric Form and Exponential Form of Fourier series – Conditions of Symmetry - Line Spectra and Phase Angle Spectra - Analysis of Electrical Circuits to Non Sinusoidal Periodic Waveforms. Fourier Integrals and Fourier Transforms – Properties of Fourier Transforms and Application to Electrical Circuits.

Unit Outcomes:

The student will be able to

- Know how to apply Fourier transforms studied in Mathematics to Electrical circuits for non-sinusoidal periodic and non-periodic input waves
- Understand properties of Fourier series and Transforms

Unit - V: Filters

Filters – Low Pass – High Pass and Band Pass – RC, RL filters– derived filters and composite filters design – Attenuators – Principle of Equalizers – Series and Shunt Equalizers – L Type - T type and Bridged – T and Lattice Equalizers.

Unit Outcomes:

The student will be able to

- Understand about what is a Filter, Classification, where they can be used, etc.
- Understand about attenuators and equalizers used in electronic high frequency circuits

Course Outcomes:

- Understand the analysis of three phase balanced and unbalanced circuits and to measure active and reactive powers in three phase circuits.
- To get knowledge about how to determine the transient response of R-L, R-C, R-L-C series circuits for D.C and A.C excitations.
- Applications of Fourier transforms to electrical circuits excited by non-sinusoidal sources are known.
- Design of filters, equalizers and PSPICE programs for Circuit Analysis.

Text Books:

1. William Hayt, Jack E. Kemmerly and Jamie Phillips, "Engineering Circuit Analysis", Mc Graw Hill, 9th Edition, 2019.
2. A. Chakrabarti, "Circuit Theory: Analysis & Synthesis", Dhanpat Rai & Sons, 2008.

Reference Books:

1. M.E. Van Valkenberg, "Network Analysis", 3rd Edition, Prentice Hall (India), 1980.
2. V. Del Toro, "Electrical Engineering Fundamentals", Prentice Hall International, 2009.
3. Charles K. Alexander and Matthew. N. O. Sadiku, "Fundamentals of Electric Circuits" Mc Graw Hill, 5th Edition, 2013.
4. Mahamood Nahvi and Joseph Edminister, "Electric Circuits" Schaum's Series, 6th Edition, 2013.
5. John Bird, Routledge, "Electrical Circuit Theory and Technology", Taylor & Francis, 5th Edition, 2014.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

L	T	P	C
2	1	0	3

19A02402 ENGINEERING ELECTROMAGNETICS

Course Objectives:

- To understand the basic principles of electrostatics
- To understand the basic principles of magneto statics for time invariant and time varying fields
- To understand the principles of dielectrics, conductors and magnetic potentials

UNIT-I ELECTROSTATICS

Electrostatic Fields - Coulomb's Law - Electric Field Intensity (EFI) due to Line, Surface and Volume charges- Work Done in Moving a Point Charge in Electrostatic Field-Electric Potential due to point charges, line charges and Volume Charges - Potential Gradient - Gauss Law-Application of Gauss Law-Maxwell's First Law – Numerical Problems.
Laplace and Poisson Equations - Solution of Laplace Equation in one Variable. Electric Dipole - Dipole Moment - Potential and EFI due to Electric Dipole - Torque on an Electric Dipole in an Electric Field – Numerical Problems.

Unit Outcomes:

- Able to Determine electric field and potentials using Coulomb's law & Gauss law.
- Analyze Potential differences for different configurations.
- Able to Classify static electric magnetic fields in different engineering situations.
- Able to Determine the Concepts of Electric dipole, Electrostatic Energy and Energy density.

UNIT- II CONDUCTORS AND DIELECTRICS

Behaviour of Conductors in an Electric Field-Conductors and Insulators – Electric Field Inside a Dielectric Material – Polarization – Dielectric Conductors and Dielectric Boundary Conditions – Capacitance-Capacitance of Parallel Plate, Spherical & Co-axial capacitors – Energy Stored and Energy Density in a Static Electric Field – Current Density – Conduction and Convection Current Densities – Ohm's Law in Point Form – Equation of Continuity – Numerical Problems.

Unit Outcomes:

- Analyze the Concepts of Conduction and Convection currents.
- Understand the concept of capacitance for parallel plates, spherical & co-axial capacitors.
- Able to Calculate Energy stored and energy density in a static electric fields.

UNIT-III MAGNETO STATICS

Static Magnetic Fields – Biot-Savart Law – Oersted's experiment – Magnetic Field Intensity (MFI) due to a Straight, Circular &Solenoid Current Carrying Wire – Maxwell's Second Equation. Ampere's Circuital Law and its Applications Viz., MFI Due to an Infinite Sheet of Current and a Long Current Carrying Filament – Point Form of Ampere's Circuital Law – Maxwell's Third Equation – Numerical Problems.

Magnetic Force — Lorentz Force Equation – Force on Current Element in a Magnetic Field - Force on a Straight and Long Current Carrying Conductor in a Magnetic Field - Force Between two Straight and Parallel Current Carrying Conductors – Magnetic Dipole and Dipole moment – A Differential Current Loop as a Magnetic Dipole – Torque on a Current Loop Placed in a Magnetic Field – Numerical Problems.

Unit Outcomes:

- Analyze the Concepts of Magnetic field intensity using Biot-Savart Law & Ampere Law.
- Able to understand Maxwell's equations.
- Develop MFI due to an infinite sheet of current and a long filament carrying conductor in Different loops.

UNIT – IV MAGNETIC POTENTIAL

Scalar Magnetic Potential and Vector Magnetic Potential and its Properties - Vector Magnetic Potential due to Simple Configuration – Vector Poisson's Equations.

Self and Mutual Inductances – Neumann's Formulae – Determination of Self Inductance of a Solenoid and Toroid and Mutual Inductance Between a Straight, Long Wire and a Square Loop Wire in the Same Plane – Energy Stored and Intensity in a Magnetic Field – Numerical Problems.

Unit Outcomes:

- Understand scalar magnetic potential and vector magnetic potential and its applications.
- Able to calculate the magnetic forces and torque produced by currents in Magnetic Field.
- Ability to calculate self and mutual Inductances.
- Analyze the Concepts of Magnetic boundary conditions & Energy stored in the Magnetic field.

UNIT-V TIMEVARYING FIELDS

Faraday's Law of Electromagnetic Induction – It's Integral and Point Forms – Maxwell's Fourth Equation. Statically and Dynamically Induced E.M.F's – Simple Problems – Modified Maxwell's Equations for Time Varying Fields – Displacement Current.
Wave Equations – Uniform Plane Wave Motion in Free Space, Conductors and Dielectrics – Velocity, Wave Length, Intrinsic Impedence and Skin Depth – Poynting Theorem – Poynting Vector and its Significance**.**

Unit Outcomes:

- Acquires knowledge on time varying fields & Faraday's law for Electromagnetic induction
- Analyze the Concepts Maxwell's Equations in Different Forms.
- Understand the Concepts Calculation of Poynting vector & Theorem.
- Analyze the Concepts of Wave Theory

Course Outcomes:

After completion of the course, the student will be able to:

- Understand the concept of electrostatics
- Understand the concepts of Conductors and Dielectrics
- Understand the fundamental laws related to Magneto Statics
- Understand the concepts of Magnetic Potential and Time varying Fields

TEXT BOOKS:

1. Sadiku, Kulkarni, "Principles of Electromagnetics", 6th Edition, Oxford University Press, 2015
2. William.H.Hayt, "Engineering Electromagnetics", Mc Graw Hill, 2010.

REFERENCE BOOKS:

1. J.D.Kraus, "Electromagnetics", 5th Edition, Mc Graw Hill Inc, 1999.
2. David K. Cheng, "Field & Electromagnetic Waves", 2nd Edition, 1989.
3. Joseph A. Edminister, "Electromagnetics", 2nd Edition, Schaum's Outline, Mc Graw Hill, 2017.
4. K.A. Gangadhar and P.M. Ramanathan, "Electomagnetic Field Theory", 8th Reprint, Khanna Publications, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

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2	1	0	3

19A02403 POWER ELECTRONICS

Course Objectives:

The student will be able to:

1. Understand the differences between signal level and power level devices.
2. Analyze controlled rectifier circuits.
3. Analyze the operation of DC-DC choppers.
4. Analyze the operation of voltage source inverters.

UNIT-I: Power Switching Devices

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET, IGBT and GTO.

Unit Outcomes:

At the end of the unit, students will be able to

- Understand the basic power semiconductor devices their construction, principle of working and their characteristics.
- Understand in detail about SCR i.e., its characteristics, series and parallel connection of SCR's, specification, its ratings and various commutation methods.
- Apply the above concepts to solve numerical problems.

UNIT-II: Thyristor Rectifiers

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape and power factor-Numerical problems.

Unit Outcomes:

At the end of the unit, students will be able to

- Understand the concepts of phase control technique, midpoint and bridge connections of half and full controlled converters with various loads for both 1Ø and 3Ø phase converters, effect of source inductance and dual converters.
- Analyze and evaluate voltages and currents, active and reactive power inputs to converter with and without freewheeling diode for 1Ø and 3Ø converters.
- Apply the above concepts to solve numerical problems.

UNIT-III: DC-DC buck converter

Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage.

DC-DC boost converter:

Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

Unit Outcomes:

At the end of the unit, students will be able to

- Understand the concepts of various control strategies, types of choppers and analyze their principle operation, waveforms of voltages and currents at different loads.
- Apply the above concepts to solve numerical problems.

UNIT-IV:

Single phase Voltage Source inverters – operating principle - steady state analysis, Simple forced commutation circuits for bridge inverters – Mc Murray and Mc Murray Bedford inverters, Voltage control techniques for inverters and Pulse width modulation techniques, single phase current source inverter with ideal switches, basic series inverter, single phase parallel inverter – basic principle of operation only, Three phase bridge inverters (VSI) – 180 degree mode – 120 degree mode of operation - Numerical problems.

Unit Outcomes:

At the end of the unit, students will be able to

- Understand the construction, working of single phase voltage inverters with their waveforms in various operating modes when different loads are applied and the different modulating techniques available.
- Understand the construction, working of three phase voltage inverters with their waveforms in various operating modes when different loads are applied, harmonic components and the different modulating techniques available.
- Apply the above concepts to solve numerical problems.

UNIT-V: AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS:

AC voltage controllers – Principle of phase control – Principle of integral cycle control - Single phase two SCRs in anti parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – RMS load voltage, current and power factor - wave forms – Numerical problems. Cyclo converters - Midpoint and Bridge connections - Single phase to single phase step-up and step-down cyclo converters with Resistive and inductive load, Principle of operation, Waveforms, output voltage equation.

Unit Outcomes:

At the end of the unit, students will be able to

- Understand the concept of AC voltage controllers
- Understand the concept of Cyclo Converters

Course Outcomes:

At the end of this course students will be able to:

- Understand the operation, characteristics and usage of basic Power Semiconductor Devices.
- Understand different types of Rectifier circuits with different operating conditions.
- Understand DC-DC converters operation and analysis of their characteristics.
- Understand the construction and operation of voltage source inverters, Voltage Controllers and Cyclo Converters.
- Apply all the above concepts to solve various numerical problem solving

TEXT BOOKS:

1. M. H. Rashid, “Power Electronics: Circuits, Devices and Applications”, 2nd edition, Prentice Hall of India, 1998
2. P.S.Bimbhra,”Power Electronics”, 4th Edition, Khanna Publishers, 2010.
3. M. D. Singh & K. B. Kanchandhani, “Power Electronics”, Tata Mc Graw Hill Publishing Company, 1998.

REFERENCE BOOKS:

1. Ned Moha, “Power Electronics”, Wiley, 2011.
2. Robert W. Erickson and Dragan Maksimovic, “Fundamentals of Power Electronics” 2nd Edition, Kluwer Academic Publishers, 2004.
3. Vedam Subramanyam, “Power Electronics”, New Age International (P) Limited, 1996.
4. V.R.Murthy, “Power Electronics”, 1st Edition, Oxford University Press, 2005.
5. P.C.Sen, “Power Electronics”, Tata Mc Graw-Hill Education, 1987.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

L	T	P	C
2	1	0	3

19A04405 ANALOG ELECTRONIC CIRCUITS

Course Objectives:

- List various types of feedback amplifiers, oscillators and large signal Amplifiers.
- Explain the operation of various electronic circuits and linear ICs.
- Apply various types of electronic circuits to solve engineering problems
- Analyse various electronic circuits and regulated power supplies for proper understanding
- Justify choice of transistor configuration in a cascade amplifier.
- Design electronic circuits for a given specification.

Unit 1

Multistage Amplifiers: Classification of amplifiers, different coupling schemes used in amplifiers, general analysis of cascade amplifiers, Choice of transistor configuration in a cascade amplifier, frequency response and analysis of two stage RC coupled and direct coupled amplifiers, principles of Darlington amplifier, Cascode amplifier.

Unit outcomes:

- Name different coupling schemes in amplifiers (L1)
- Explain the principles of Darlington amplifier (L2)
- Apply multistage amplifiers to solve engineering problems (L3)
- Analyse multistage amplifiers (L4)
- Justify choice of transistor configuration in a cascade amplifier (L5)

Unit 2

Feedback Amplifiers: Concepts of Feedback, Classification of Feedback Amplifiers, Transfer Gain with Feedback, General Characteristics of Negative-Feedback Amplifiers, Effect of Feedback on Amplifier characteristics, Analysis of a feedback Amplifiers - Voltage – Series, Current-Series, Current-shunt and Voltage – shunt.

Oscillators

Sinusoidal Oscillators, Conditions for oscillations, Phase - shift Oscillator, Wien Bridge Oscillator, L-C Oscillators (Hartley and Colpitts).

Unit Outcomes:

- Classify feedback amplifiers and oscillators (L1)
- Explain the concept of feedback and conditions for oscillations (L2)
- Apply the feedback amplifiers and oscillators to solve engineering problems (L3)
- Analyse feedback amplifiers and oscillator (L4)

Unit 3

Large Signal Amplifiers(Power Amplifiers): Introduction, Classification, Class A large signal amplifiers, Second - Harmonic Distortion, Higher - Order Harmonic Generations, Transformer Coupled Class A Audio Power Amplifier, Efficiency of Class A, Class B, Class AB Amplifiers, Distortion in Power Amplifiers, Class C Power Amplifier.

Unit Outcomes:

- Classify the large signal amplifiers (L1)
- Explain the operation of different types of large signal amplifiers (L2)
- Apply large signal amplifiers in a given engineering situation (L3)
- Analyse harmonic distortion in large signal amplifiers (L4)

Unit 4: Linear Integrated Circuits:

Operational Amplifier: Introduction, Block diagram, Characteristics and Equivalent circuits of an ideal op-amp, Various types of Operational Amplifiers and their applications, Power supply configurations for OP-AMP applications, Inverting and non-inverting amplifier configurations. The Practical op-amp: Introduction, Input offset voltage, Offset current, Thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and Gain – bandwidth product, frequency limitations and compensations, transient response.

Unit Outcomes:

- Understand different Offsets present in Op amp & nullification circuits. (L1)
- Examine performance of Op-Amp in open loop and closed configurations. (L2)
- Analyse emitter-coupled differential amplifier. (L3)
- Compare ideal and practical Op-Amps. (L5)

Unit 5: Applications of Linear Integrated Circuits:

Adder, Integrator, Differentiator, Difference amplifier and Instrumentation amplifier, Converters: Current to voltage and voltage to current converters, Active Filters: First order filters, second order low pass, high pass, band pass and band reject filters, Oscillators: RC phase shift oscillator, Wien bridge oscillator, Square wave generator.

Special Purpose Integrated Circuits: Functional block diagram, working, design and applications of Timer 555 (Monostable & Astable), Functional block diagram, working and applications of VCO 566, PLL 565, Fixed and variable Voltage regulators.

Unit Outcomes:

- Understand various applications of Linear ICs (L1)
- Explain operation of Op. Amp. in various applications, Timer, Fixed voltage regulators(L2)
- Apply linear ICs in a given engineering situation (L3)

Course outcomes:

On successful completion of the course, the student shall be able to

CO1. List various types of feedback amplifiers, oscillators and large signal amplifiers (L1)

CO2. Explain the operation of various electronic circuits and linear ICs (L2)

CO3. Apply various types of electronic circuits to solve engineering problems (L3)

CO4. Analyse various electronic circuits and regulated power supplies for proper understanding (L4)

CO5. Justify choice of transistor configuration in a cascade amplifier (L5)

CO6. Design electronic circuits for a given specification (L6)

Text Books:

1. Millman, Halkias and Jit, "Electronic Devices and Circuits", 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2015.
2. Salivahanan and N. Suresh Kumar, "Electronic Devices and Circuits", 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2017.
3. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", 4th Edition, Pearson, 2017.

Reference Books:

1. Millman and Taub, Pulse, Digital and Switching Waveforms, 3rd Edition, Tata McGraw-Hill Education, 2011.
2. J. Milliman, C. C. Halkias and Chetan Parikh, "Integrated Electronics", 2nd Edition, Mc Graw Hill, 2010.
3. David A. Bell, "Electronic Devices and Circuits", 5th edition, Oxford Press, 2008.
4. D. Roy Choudhury, "Linear Integrated Circuits", 2nd Edition,New Age International (p) Ltd, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-II Sem

L	T	P	C
2	1	0	3

19A05304T PYTHON PROGRAMMING

Course Objectives:

1. To learn the fundamentals of Python
2. To elucidate problem-solving using a Python programming language
3. To introduce a function-oriented programming paradigm through python
4. To get training in the development of solutions using modular concepts
5. To introduce the programming constructs of python

Unit – I

Introduction: What is a program, Running python, Arithmetic operators, Value and Types.

Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.

Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

Unit Outcomes:

Student should be able to

- List the basic constructs of Python.
- Solve the problems by applying modularity principle.

Unit – II

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.

Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types,

Unit Outcomes:

Student should be able to

- Apply the conditional execution of the program.
- Apply the principle of recursion to solve the problems.

Unit – III

Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.
Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.
Case Study: Reading word lists, Search, Looping with indices.
Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

Unit Outcomes:

Student should be able to

- Use the data structure list.
- Design programs for manipulating strings.

Unit – IV

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.
Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.
Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.
Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.
Classes and Functions:

Unit Outcomes:

Student should be able to

- Apply object orientation concepts.
- Use data structure dictionaries.
- Organize data in the form of files.

Unit – V

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning

Classes and Methods: Object oriented features, Printing objects, The init method, The __str__method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args,

Unit Outcomes:

Student should be able to

- Plan programs using object orientation approach.
- Illustrate the principle of inheritance.

Course Outcomes:

Student should be able to

1. Apply the features of Python language in various real applications.
2. Select appropriate data structure of Python for solving a problem.
3. Design object oriented programs using Python for solving real-world problems.
4. Apply modularity to programs.

Text books:

1. Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.

Reference Books:

1. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
3. R. Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019

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B.Tech – II-II Sem

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0	0	3	1.5

19A02401P ELECTRICAL CIRCUIT ANALYSIS LAB

Course Objectives:

1. Understand and experimentally verify various resonance phenomenon
2. Understand and analyze various current locus diagrams.
3. Apply and experimentally analyze two port network parameters
4. Simulation of various circuits using PSPICE software.

Experiments:

1. Locus Diagram of RL Series Circuits:
   a) Variable 'R' and Fixed 'L' b) Variable 'L' and Fixed 'R'
2. Locus Diagram of RC Series Circuits:
   a) Variable 'R' and Fixed 'C' b) Variable 'C' and Fixed 'R'
3. Series Resonance
4. Parallel Resonance
5. Determination of Z Parameters
6. Determination of Y Parameters
7. Transmission Parameters
8. Hybrid Parameters
9. Determination of Coefficient of coupling

PSPICE Simulation Experiments:

1. Simulation of DC Circuits
2. Simulation of AC Circuits
3. DC Transient Response
4. Mesh Analysis
5. Nodal Analysis

References:

1. David A. Bell, Fundamentals of Electric Circuits: Lab Manual OUP Canada, 7th Edition, 2009.
2. Muhammad H. Rashid, Introduction to PSPICE using OrCAD for Circuits and Electronics, Pearson Education, 3rd Edition, 2003.

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B.Tech – II-II Sem

L	T	P	C
0	0	3	1.5

19A04406 ELECTRONIC CIRCUITS LAB

Course Objectives:

- To learn basic techniques for the design of analog circuits, digital circuits and fundamental concepts used in the design of systems.
- To design and analyze multistage amplifiers, feedback amplifiers and OP AMP based circuits.
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.

PART A

List of Experiments:

1. Design and simulate two stage RC coupled amplifier for given specifications. Determine Gain and Bandwidth from its frequency response curve.
2. Design and simulate Darlington amplifier. Determine Gain and Bandwidth from its frequency response curve.
3. Design and simulate voltage series feedback amplifier for the given specifications. Determine the effect of feedback on the frequency response of a voltage series feedback amplifier.
4. Design RC Phase shift oscillator/Wien bridge oscillator and square wave generator for the given specifications. Determine the frequency of oscillation.
5. Analyze a Class B complementary symmetry power amplifier and observe the waveforms with and without cross-over distortion. Determine maximum output power and efficiency.
6. Design inverting and noninverting amplifiers for the given specifications using OP-AMP and verify the same experimentally.
7. Design practical differentiator and integrator circuits using OP-AMP for the given specifications and verify the same practically.
8. Design a second order low pass and high pass active filters using OP-AMP using the given specifications. Verify them practically.
9. Design an astablemulti-vibrator circuit for the given specifications using 555 timer. Observe ON & OFF states of transistor in an astablemulti-vibrator. Plotoutput waveforms.

Note: Design & simulate any 6 experiments with Multisim / PSPICE or equivalent software and verify the results in hardware lab with discrete components.

PART B

List of Experiments:

1. To study basic gates (AND, OR, NOT) and verify their truth tables.
2. Realization of Boolean Expressions using Gates
3. Design a 3 – bit Adder / Subtractor
4. Design and realization a 4 – bit gray to Binary and Binary to Gray Converter
5. Design and construct basic flip-flops R-S,J-K,J-K Master slave flip-flops using gates and verify their truth tables
6. Design and implementation of Mod-N synchronous counter using J-K flip-flops.
7. Design and implementation of i) Ring counter and ii) Johnson counter using 43 bit shiftregister
8. Design and realization of 8x1 MUX using 2x1 MUX

Note: Student has to perform minimum of 4 experiments using digital ICs

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Analyze various amplifier circuits.
- Design multistage amplifiers.
- Design OPAMP based analog circuits.
- Understand working of logic gates.
- Design and implement Combinational and Sequential logic circuits.

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B.Tech – II-II Sem

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19A99301 ENVIRONMENTAL SCIENCE

Course Objectives:

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

UNIT – I

Multidisciplinary Nature Of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

Unit Outcomes

- To know the importance of public awareness
- To know about the various resources

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity And Its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Course Outcomes:

- To know about various echo systems and their characteristics
- To know about the biodiversity and its conservation

UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management : Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Course Outcomes:

- To know about the various sources of pollution.
- To know about the various sources of solid waste and preventive measures.
- To know about the different types of disasters and their managerial measures**.**

UNIT – IV

Social Issues And The Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act –

Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Course Outcomes:

- To know about the social issues related to environment and their protection acts.
- To know about the various sources of conservation of natural resources.
- To know about the wild life protection and forest conservation acts.

UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Unit Outcomes:

- To know about the population explosion and family welfare programmes.
- To identify the natural assets and related case studies.

Course Outcomes:

At the end of the course, the student will be able to

- Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.
- Understand flow and bio-geo- chemical cycles and ecological pyramids.
- Understand various causes of pollution and solid waste management and related preventive measures.
- About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
- Casus of population explosion, value education and welfare programmes.

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.Azeem Unnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

REFERENCES:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Pubilishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.